FORUM

Laying the Groundwork With Basic Research

Some might say that basic biological research should be more the province of academia than of a government agency like the Agricultural Research Service. But basic research often provides the starting point, the groundwork for all other work, including research that deals with problems affecting the country's agriculture.

When a new pest appears, if scientists can't at least come up with an accurate name and some basic facts about the organism's place in the environment, it is going to be hard for any other studies to get off the ground. For example, knowing where an insect originated and having some information on its relationship to other species is often the first step in understanding what kind of problem it will be and how a control can be devised for it.

Developing this kind of fundamental information is not a job you want to have to do after the insect becomes a problem for farmers and ranchers. If we wait to study an insect until there is a crisis, it can take months or years to pull together the necessary basic information to get control programs up and running. In the meantime, damage can be accumulating, diseases may be spread, and export markets for a U.S. commodity could be lost. Being a step ahead can make the difference between a crisis and a problem with a solution.

This means basic research must be done on an ongoing basis, always building our reservoir of knowledge so we are ready to respond. When you know where an insect comes from, you have a much better idea of where to start looking for its natural enemies that could be biological controls or where in the United States it might be the biggest threat.

It can come as a surprise that despite centuries of research by biologists and taxonomists, we don't already have a full catalog of this country's insects, let alone those that inhabit other parts of the planet. In contrast, most species of North American birds have entire volumes dedicated to their life histories, with everything from how many eggs they lay to the insects on which they prefer to dine. But the vast majority of the small, often inconspicuous creatures that make up the insect genera remain pretty much unknown. For probably 90 percent of those that we do know—that is, they have at least been named—we often know little beyond where the specimen was found. This is in spite of the fact that pests and invasive species cause tens of billions of dollars in damage each year.

That's why ARS considers basic research like that of entomologists Shoil Greenberg, Allan Showler, and Thomas Sappington so important. They are studying which plants a beet armyworm prefers for egg laying. It is the first step toward the applied research of finding a better way to controlling this major cotton pest. You can read more about their research on page 20 of this issue.

One of the world's leaders in building databases of basic information about insects is ARS' Systematic Entomology Laboratory, with facilities at the Henry A. Wallace Beltsville (Maryland) Agricultural Research Center and at the Smithsonian Institution in Washington D.C. The lab is profiled on page 4.

SEL scientists concentrate on insect groups they expect could be trouble for U.S. agriculture, so when something shows up, the basic information is already available for the scientists charged with dealing with the problem. They are also the experts to whom everyone from evolutionary biologists to forensic scientists turn when help is needed with an insect identification.

Some of SEL's most important customers are the federal officials responsible for agricultural quarantine. They look to SEL not only for identification of strange insects that try to enter the country, but also for information about potential biocontrols from foreign countries before deciding whether to issue importation and release permits.

Today, ARS scientists at our locations around the country are applying the newest, high-tech research methods alongside traditional techniques of studying pests, like the researchers profiled on page 9, who are uncovering the most basic level of information about the *Varroa* mite. They are developing a genetic profile of this mite in hopes it will pay off in a new way to stop this devastating pest of honey bees.

Basic and applied research have become more integrated as we develop a deeper understanding of the relationships between the complex components of our environment—soil, water, air, and all living creatures, including ourselves. Research into the most basic processes of biology and ecology will provide keys for advances not yet even imagined.

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